

**Final Exam**  
**AB E 312 Electrical Power**  
December 11, 2001

Calculators allowed. No other aids permitted.  
Answer all questions in the exam sheets.

Maximum 3 hours

- (10) 1) Define the following terms. Use sketches, equations and circuit diagrams as necessary. You must describe what each term is or means. Simply indicating how a term may be calculated, as an example, will not be sufficient to receive full marks.
- differential compound generator
  - compensating windings
  - Wye (or Y) connected load
  - slip
  - resistance split-phase motor
- (8) 2) Explain (how and why) a shunt DC motor would respond (with respect to shaft torque and speed) if the resistance in the field circuit was increased.
- (5) 3) We know that the voltage-load current curve for a shunt DC generator lies “below” the voltage-load current curve for a separately excited DC generator. Explain why this is the case.
- 4) The voltage between lines a-b-c of Figure 1 is 620 V.
- What is the voltage across each resistor?
  - If  $R=15 \Omega$ , what is the current in each line?
  - Calculate the power supplied to the 3-phase load.

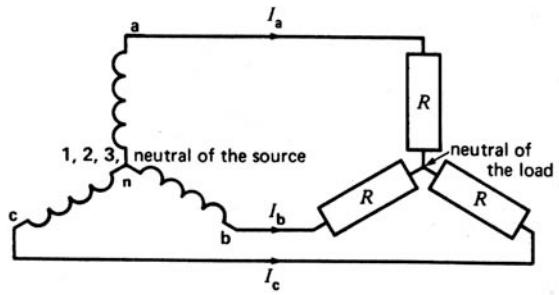


Figure 1. Three-phase source and load

- 5) The current in a 60 Hz single-phase motor lags 36 degrees behind the voltage.
- Calculate the time interval between the positive peaks of voltage and current.
  - Sketch a phasor diagram of the voltage and current.
- (6) 6) Describe (don't simply list) 2 ways to control the speed of a single-phase motor.
- (6) 7) Describe the two circuits inside a typical magnetic starter and what they control.

- 8) An AC voltage is supplied to a network consisting of a resistor, an inductor and a capacitor, all connected in series. The value of the resistance is  $150 \Omega$ , the inductor is  $0.2 \text{ H}$  and the capacitor is  $100 \text{ micro farads}$ . The AC voltage has a magnitude of  $50 \text{ V}$  and a frequency of  $60\text{Hz}$ . Remember to show your work in the following calculations.
- (10) a) Calculate the magnitude of the total impedance of the RLC network.
- (10) b) Determine the phase angle between the current and the voltage in the circuit. Is current leading or lagging? Why do you think so?
- (10) 9) Draw the electrical schematic diagram for a circuit containing a live convenience outlet and a switched light (convenience outlet, light then switch in order of progression from the service entrance). Include the breaker size and type, the conductor colours, screw colours, cable number and type.

The End

\*\* Merry Christmas \*\*